Descriptive study of the language characteristics of senile patients as measured by a test of aphasia

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A DESCRIPTIVE STUDY OF THE LANGUAGE CHARACTERISTICS
OF SENILE PATIENTS AS MEASURED BY A TEST OF APHASIA

By

Linda L. Clark

B. A. University of Montana, 1966

Presented in partial fulfillment of the requirements
for the degree of Master of Arts

UNIVERSITY OF MONTANA

1968

Approved by:

[Signatures and dates]

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Special thanks are extended to Dr. Richard M. Boehmmer for his support and encouragement throughout the course of the author's graduate studies.

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CHAPTER I
INTRODUCTION

Through the years, language disorders have been extensively studied, as has been the case with aphasia, and much has been accomplished towards an understanding of these areas. However, there are many areas in which deficits in understanding are evident. (In reviewing the literature concerned with senile patients, it was implied that senile patients have language disorders.) Coleman (1964, p.501) describes their speech as "becoming rambling, circumstantial, and often incoherent."

Allison (1958, p.310) notes that the chief speech disturbances observed in these patients are "lack of spontaneity; leaving sentences unfinished; little use of paraphrase...." And yet another writer observes evidence of confusion, disorientation and loss of memory (Ferguson, 1959, p.232). Although suggesting evidence of disorders of language in the senile population, the literature reviewed contains very little research in reference to this specific area.

It is the purpose of this study to describe some of the language characteristics of senile patients.
DEFINITION OF SENILITY

Webster's New World Dictionary (1958, p.492) defines senility as the state of being "weak in mind and body." However, to provide a more functional usage of the terms "senility" or "senile dementia," a description of the pathologies and behavioral characteristics associated with senility are presented. Busse (1960, p.378) notes the following anatomical changes which accompany senile dementia: (1) shrinkage of the cerebral cortex; (2) widening of the sulci; (3) slight or moderate fibrous thickening of the pia-arachnoid; (4) shrinking and atrophy of nerve cells; and (5) senile plaques, which are small areas of tissue degeneration. Ferraro (1959) is in agreement with Busse with respect to the pathological changes. However, he notes that there is no direct correlation between cerebral pathological findings in senile dementia and the development of mental symptoms. He further reports that there is a lack of correlation between the severity of the pathological changes and the severity of intellectual impairment.

Ferraro (1959, p.102?) reports the following:

The most common signs of senility are characterized by diminution of acuity of perceptions; graying of the hair; thinning, atrophy, and wrinkling of the skin; wasting of muscular tissue and loss of its firmness; and increasing tremors, postural changes, and changes in gait.
Other researchers report the following characteristics: loss of memory, absent-mindedness, and overtalkativeness (Stieglitz, 1954, p. 264); disorientation in time and space, and restlessness (Ehrentheil, 1957, p. 429); lack of spontaneity, leaving sentences unfinished, lack of usage of paraphrase... (Allison, 1958, p. 310).

Ehrentheil (1957) reports that the mode of onset is insidious, and that the age of onset is generally between 60 years and 90 years, with the average being 75 years. Ferraro (1959), however, states that he found that first admissions for senile dementia in New York civil state hospitals were between 55 and 70 or more years of age, with rare cases developing between the ages of 45 and 55 years. The age of admission does not necessarily mean the age of onset, as many cases may be cared for in the home before the family decides upon hospitalization.

In summary, senility is a disorder generally occurring after age 50, and is characterized by rambling, circumstantial speech, evidence of confusion and disorientation, and loss of memory. The pathologies accompanying the disorder include general brain deterioration and senile plaques. There are apparently no objective measures for diagnosis of this disorder.
REVIEW OF LITERATURE

The review of the literature is concerned with objective studies of the speech and language characteristics of senile patients.

Feldman and Cameron (1945, p. 64) studied the speech of senile patients and state that prior to their study, "no objective analysis of the speech of seniles has been reported." In their study, they compare a grammatical analysis of the speech of 28 psychotic senile patients with that of the speech of 17 normal adults and 3 normal children. They asked each subject to describe in his own words each of four pictures from the Stanford-Binet test to measure interpretation and reasoning. Samples of 400 words each were analyzed as to frequency of each of 8 parts of speech for each 100 words. They found that the parts of speech which manifest differences between senile and normal subjects are verbs, adjectives, and pronouns.

"The proportionately large use of pronouns may reflect the repetitiousness, hesitancy, and 'roughness' of the senile subjects' language" (Feldman and Cameron, 1945, p. 67). The writers note that because pronouns are short words and are frequently used to initiate sentences and phrases, they are perhaps more prone to repetition than other words.
Feldman and Cameron (1945) find the average verb-adjective ratio of the senile groups to be 2.99, and that of the normal subjects to be 1.52. Boder (1940, p.314) attempts a psychological analysis of the verb-adjective relationships and suggests the following considerations:

1. The adjective is a name of quantities—it involves elements of analysis and evaluation.

2. The adjective is a phenomena of speech complication and economy at the same time. It increases the number of words in a sentence, but makes fewer sentences necessary. Use of the adjective therefore seems to require a higher level of speech.

3. The adjective and noun used together constitute psychologically a single unit. Use of these units requires a creative linguistic attitude.

4. Placement of the adjective before the noun is a relatively new development in language. This order is found, for example, in modern German and English, while the adjective follows the noun in Hebrew and Latin. This may suggest that the adjective used in the English language reflects linguistic progress.

Feldman and Cameron (1945, p.65) interpret Boder's suggestions as an indication that "a more complex linguistic ability may be required for the use of adjectives," and that "the diminished employment of adjectives by senile patients may reflect simply this failing capacity to express themselves by means of the more complex mechanisms of speech."

Acklesberg (1944) conducted a study entitled "Vocabulary and Mental Deterioration in Senile Dementia."
in which he tried to establish a reliable index of deterioration in senile dementia. For this purpose he gave the following tests to a group of 50 subjects between the ages of 60 years and 85 years, one-half of which were males: (1) synonym test; (2) antonym test (to determine the subjects' ability to see relationships between words and to differentiate between similarities and differences); (3) categorization test; (4) word naming test (to see if there was a difference in the rate and quantity of the words produced by the use of a free association technique); and (5) 12 homographs from Lorge's Semantic Count were presented and the subjects asked to give different meanings to see if they could accomplish a shift from one mental activity to another on a verbal basis. Acklesburg reports that the general level of vocabulary functioning shows a positive relationship to the estimated levels of mental deterioration in senile dementia (least deteriorated, mildly deteriorated, and the most deteriorated). He also notes that all subjects scored very low on the word naming test, but only the critical ratio between the least deteriorated and the most deteriorated group shows a reliable difference, so this test can not be considered a reliable index of deterioration in senile dementia. He reports a reliable, consistent, and progressive reduction in the mean scores of the synonym and
antonym tests associated with the groups of subjects which had the greater amount of mental deterioration. Feldman and Cameron (1945, p.405) support these findings and report that, "separate vocabulary tests not only show progressive impairment in ability to deal with word meanings, but they also reflect an impairment in related aspects of mental functioning." In conclusion, Acklesburg offers the synonym and antonym tests as reliable and valid measures of mental deterioration in senile dementia and as aids in classifying patients.

Ferraro (1959, p.1025) reports that the senile patients' vocabulary gradually becomes disorganized, with names of things being recalled with difficulty. He also observes that circumlocutions and descriptive phraseology may be used instead of names, and that gradually adjectives may also fail.

The most recent study conducted with reference to the language of the senile population was by Mitton (1967). His purpose was to determine if it were possible to differentiate between a group of aphasic patients and a group of senile patients on the basis of their performances on an aphasia test, specifically the Eisenson test battery.

Mitton used 15 aphasic patients who had histories of cerebral vascular accident and who demonstrate moderate disturbances in at least two of the linguistic functions
measured by the Eisenson test. The age range of the aphasic group, "Group A," was 54 to 70 years, and the median age was 62 years. The senile group, "Group S," was composed of 15 senile patients with etiologies of cerebral arteriosclerosis, and with no histories of cerebral vascular accidents. They had been referred to the examiner by the hospital doctors and staff as being senile. They also scored 8 or lower on the "new Learning" test of the Psychological Abilities Scale for Seniles, which is a recently standardized test for evaluation of senile patients (Kaplan et al., 1966). The age range of this group was 63 to 84 years and the median age was 73 years. The amounts of disturbance demonstrated by the patients of each group were totaled for each of the functions tested, and the results of the Eisenson test battery were reported in terms of "total score" and in terms of the mean score for the group.

Mitton found that in all functions tested, Group A subjects demonstrated greater amounts of disturbance than did Group S subjects. In terms of quantitative differences, the following disturbances were more characteristic of the aphasic patients at the .01 level of significance: (1) moderate disturbance of verbal apraxia for words; (2) moderate disturbance of verbal apraxia for sentences; (3) moderate disturbance
in reciting the alphabet; (4) severe disturbance in spelling; (5) severe to complete disturbance in writing from dictation; and (6) moderate disturbance in oral reading.

The following disturbances were found to be significantly more characteristic of aphasic patients at the .05 level of significance: (1) little disturbance in verbal apraxia for numbers; (2) little disturbance in counting to 20; (3) little disturbance in reciting the months of the year; (5) little disturbance in singing; (6) little to moderate disturbance in writing numbers; and (7) moderate disturbance in word finding.

In reviewing the quantitative results of the study, it would appear that Mitton fulfilled the purpose of his study which was to see if it were possible to differentiate between a group of aphasic geriatric patients and a group of senile geriatric patients on the basis of their performances on an aphasia test. That is, he shows that although the senile geriatric group may not perform perfectly in response to the test battery, he will not miss as many items as the aphasic group for whom the test was designed.

Mitton recommends that the following tests of the Eisenson battery should be given to groups of aphasic patients and senile patients, and that they may be of
prognostic value in differentiating between the groups:
(1) verbal apraxia for numbers, words, and sentence;
(2) automatic speech; (3) writing numbers; (4) spelling;
(5) writing from dictation; (6) word-finding; and (7) oral reading.

Mitton also reports qualitative differences between his two groups. These differences were evaluated subjectively from notes on the record blanks of each subject regarding the manner in which the patients responded to the tests. He indicates that 12 out of 15 senile patients tended to confabulate when questioned, often not providing an acceptable answer unless their attention was redirected to the question. The verbal responses of the senile subjects were recorded verbatim, and were characterized by many short sentences, such as the following responses given by a female patient during the word-finding test: When asked, "On what do you cock?" she replied, "Cook? I used to cook. I cooked a lot. Mother did, too. Mostly corn and beans" (Mitton, 1967, p.67). Mitton notes that responses of this type were typical of those given by the senile subjects during the testing for auditory-verbal comprehension, naming, and word-finding. He reported that this type of response occurred most frequently during the test for auditory-verbal comprehension of paragraphs and that it was difficult to
obtain correct answers because the subjects in Group S seemed to forget what had been read to them once they had made statements about the general subject matter of these paragraphs.

Again, it is important to note that Mitton found differences between the responses of his two groups, but these were qualitative differences which do not give a descriptive picture of the language abilities of senile patients.

In summarizing the literature reviewed in the area of language disorders of senile patients, the following characteristics are evident: (1) increased use of pronouns; (2) decreased usage of adjectives; (3) decreased and disorganized vocabulary; (4) rambling speech; and (5) loss of memory. It is interesting to note that, with the exception of Mitton's brief reference to difficulty in the area of auditory verbal comprehension, the research conducted has been concerned primarily with the expressive language of the senile population, as opposed to receptive language abilities. Specifically, the studies dealt with vocabulary functioning and grammatical analysis, and these are but a portion of what language entails.

STATEMENT OF THE PROBLEM AND PURPOSE

The implication that senile patients do have language disorders has been pointed out in the review
of the literature. What is not apparent, however, is the nature of that problem other than qualitative reports such as those previously mentioned. If senility is of major etiological significance for approximately one-fourth of the population of Medicare accredited nursing homes such as those sampled in Missoula, it would indicate that there is sufficient need for research in this area. The problem at hand, therefore, is to provide a quantitative description of some of the language characteristics of the senile patient.

The primary purpose of the present study is to describe the language characteristics of senile patients as measured by The Minnesota Test for Differential Diagnosis of Aphasia, which was devised by Hildred Schuell.

The Minnesota Test for Differential Diagnosis of Aphasia, Form 8 (see Appendix A) was designed "to permit the examiner to observe the level at which language performance breaks down in each of the principal language modalities" (Schuell, 1965b, p.3), which are listening, speaking, reading, and writing. Because it is reported to be a sensitive test graded in difficulty and able to pick up subtle disturbances, this test was chosen as the primary tool for the present study. The Minnesota Test was standardized on 155 aphasic patients and 50 non-aphasic patients. The
test is divided into five sections: (1) 9 tests for auditory disturbances; (2) 9 tests for visual and reading disturbances; (3) 15 tests for speech and language disturbances; (4) 10 tests for visuomotor and writing disturbances; and (5) 4 tests for disturbances of numerical relations and arithmetic processes.

In addition, Form 8 (1965) differs from Forms 6 and 7 in that there has been a deletion of test items missed by a critical number of non-aphasic subjects in older age groups, thus making it more sensitive in terms of measuring the language characteristics of the older age groups.

Schuell’s data (1964, p.162) shows the following correlations between the initial and final test scores of 73 aphasic patients who were tested on The Minnesota Test before and after treatment for aphasia:

- Tests for auditory comprehension: .89
- Visual and reading tests: .83
- Speech and language tests: .79
- Visuomotor and writing tests: .82
- Numerical and arithmetic tests: .76

The authors (Schuell, et al., 1964, p.162) felt that these correlations indicated good test-retest reliability, particularly since the subjects were heterogeneous in age, education, and etiology of brain damage, as well as in pattern and severity of aphasia. The requirements for the test-retest series were two reliable tests separated by a reasonable interval of time, which in
this case ranged from one to 13 months and averaged three months.

The validity of The Minnesota Test was determined by means of a factor analysis. The analysis showed five major factors identified by numerous tests, and two minor factors identified by only one or two tests (Schuell, et al., 1964, p.136). The five major factors were interpreted as follows:

Factor 1. Language behavior
Factor 2. Visual discrimination, recognition and recall
Factor 3. Visuospatial behavior
Factor 4. Gross movements of the speech musculature
Factor 5. Recognition of stimulus equivalence

Loadings of the 69 tests on the five major factors on the varimax solution are reported in Aphasia in Adults (Schuell, et al., 1964, pp.138-139).

Schuell, et al., in Aphasia in Adults (1964) presented a description of aphasia and the Minnesota Test as it has been developed and modified over the years. The authors (Schuell, et al., 1964, p.113) have "long considered aphasia a general language deficit that crosses all language modalities and may or may not be complicated by other sequelae of brain damage." They go on to say that "the language deficit itself is characterized by reduction of available vocabulary, impaired verbal retention span, and impaired perception and production of messages, perhaps secondary to impairment
of the first two dimensions. Language is defined by Scheull, et al., (1964, p.132) as being a system which is an acquired thalamocortical organization that functions in the integration and execution of plans involving communication. Schuell divides aphasic patients into five types, of which one group is simple aphasia, or Group I aphasia. She has defined simple aphasia as "reduction of available language in all modalities, in the absence of specific perceptual, sensorimotor, or dysarthric components" (1964, p.190). Even though there are apparent differences such as age and type of cerebral pathology between the Group I aphasic and the senile patient, it appears that senile patients may have similar types of language problems as defined for simple aphasics by Schuell, however those problems of the senile patient have not yet been defined.

The secondary purpose of this study is to compare the language abilities of the senile subjects with the language abilities for Group I, or simple, aphasics as defined by Schuell. Toward this end the following null hypothesis was presented: There is no significant difference between the language abilities of Group I aphasics as defined by Schuell and the language abilities of senile patients as measured by The Minnesota Test for Differential Diagnosis of Aphasia.
CHAPTER II

PROCEDURE

Subjects. The subjects consisted of 25 adults, each chosen on the basis of the following criteria:

1. No history of traumatic brain damage, including cerebral vascular accidents, brain tumors, and cerebral hemorrhages.

2. Diagnosed as being "senile" by the attending physician and referred to as being "senile" by the registered nurse in charge of the respective Medicare accredited nursing home.

3. An average hearing threshold of 55 decibels or better in both ears in the speech frequencies.

4. Demonstrated ability to read print of the smallest type which must be read in the Schuell examination when it is presented in both visual fields.

5. Written permission to test obtained from each patient's attending physician (see Appendix B).

Preliminary subject selection on the basis of a diagnosis of senility and the absence of traumatic brain injury etiology resulted in 45 potential subjects in the three Missoula Medicare accredited nursing homes. This was approximately 24.5 percent of all the patients living in these three homes at the time of the present study. There were eight potential subjects in the Hot Springs Medicare accredited nursing home. Of these 53 potential subjects, 28 were eliminated for various
reasons including failure to meet hearing and visual screening criteria, refusal to participate in the study, and denial of permission by attending physician to test certain individuals. One patient died prior to initial testing, and one left the home. Subsequently, 18 patients from the three homes in Missoula and 7 patients from the home in Hot Springs were tested.

The 25 subjects consisted of 10 males and 15 females who ranged in age from 61 to 89 years. The mean age of the sample was 78 years. Fifty-two percent of the subjects were from 70 to 79 years of age, 40 percent were from 80 to 89 years of age, and the remaining 8 percent were from 60 to 69 years of age.

Information on the education status was available for 24 subjects. Four subjects had graduated from high school, and one of these had obtained a degree from college. The average number of school years completed for the remaining 20 subjects was 8.24 years.

The subjects were tested individually, usually in their own rooms in the homes, and environmental noise was generally minimal. Although the time needed to complete one test averaged approximately two and one-half hours, individual testing sessions were limited to 45 minutes each. It was felt that longer sessions would create unnecessary fatigue which might influence the test results.
Inter-tester reliability. Although Schuell makes no mention of inter-tester reliability, it is not within the scope of the present study to do an inter-tester reliability check on the Minnesota Test. However, because of some apparent subjectivity involved in scoring certain subtests, and recognizing that a means of providing some indication of the writer's ability to administer and score the Minnesota Test was necessary, the following procedures were undertaken: (1) the test was administered by the writer to an instructor in the University of Montana Speech Pathology and Audiology Department who was familiar with and experienced in the administration of the test; (2) the writer was supervised by the same instructor while administering the test to a patient at the Speech and Hearing Clinic; and (3) the instructor simultaneously and independently scored the test while the writer administered and scored portions of it to four nursing home patients who had etiologies of cerebral vascular accidents.

After completing the first two procedures to the satisfaction of the instructor, the third was undertaken. In comparing the results of the instructor and the writer, there were no differences noted in the scoring of the auditory tests, the tests of visual and reading disturbances, and the tests of numerical relations and arithmetic processes. There was a difference
of 5 points out of a total of 96 points on the scoring of the visuo-motor and writing section, and a difference of 3.5 points out of a possible 164 points on the scoring of the speech and language tests. However, the magnitude of these differences compared to that between the mean scores of Schuell's five diagnostic groups were relatively small in that the amount of variance evidenced between the writer and the instructor would not have been enough to place the average patient, as tested by Schuell, into a more impaired group or a less impaired group. The smallest difference in mean scores between any groups over these two sections was a difference of 9.30 between Group I and Group II over the speech and language tests.

**Analysis of data.** To meet the primary descriptive purpose of the study, measures of central tendency and dispersion, as well as percentage of error and percentage of subjects making errors are presented for each of the five sections of The Minnesota Test.

To assess the secondary purpose of the study, the t-test of significance was used to evaluate the difference between the senile subjects and Schuell's aphasic group for each of the 45 subtests for which the data was available from Schuell. The necessary raw data for the Group I aphasics was obtained from Doctor Schuell through personal correspondence.
The Group I subjects consisted of 12 males who ranged in age from 38 to 73 years. The mean age of the sample was 63 years. Eight subjects had completed high school, and two of the subjects had graduated from college. The average number of school years completed for the sample was 12.2 years.

There were two primary considerations made when the coefficient of risk was being chosen, and these were the relative consequences of either the Type I or Type II errors with respect to the null hypothesis. When the null hypothesis is true, and it is rejected, it is described as a Type I error. The major consequence of this error would be that the two groups would be treated as separate groups in terms of prognosis and treatment. However, if the null hypothesis were false, but the null hypothesis were retained, it would be described as a Type II error. The major consequence of a Type II error in this situation might be that both groups in question would be treated as though they were the same. In general the probability of a Type I error would be decreased by choosing a small coefficient of risk. However, by choosing a large coefficient of risk the probability of a Type II error is decreased and the probability of a Type I error is increased. The writer concluded that the relative consequences of committing a Type I error would be less than those of committing a Type II error, and therefore
chose a large level of significance. The results of the t-test evaluation of the previously stated null hypothesis concerning the various subtests of The Minnesota Test were considered significant at the 10 percent level.
CHAPTER III

RESULTS

Test findings. The range of errors for 25 subjects on The Minnesota Test was from 25.5 to 209.5 and the mean number of errors was 91.27 with a standard deviation of 52.15. The mean percentage of error for all tests was 15.1 percent. The means, standard deviations, mean percentage of error, and the percentage of senile subjects erring over the five sections of the Schuell test are presented in Table 1. The reported mean percentage of error is the tendency of individual subjects in addition to being the mean of the group. The means, standard deviations, mean percentage of error, and the percentage of subjects erring for individual subtests are presented in Table 2.

The range of errors for the 12 Group I aphasics tested by Schuell and her staff over five sections of The Minnesota Test was from 5 to 93, and the mean number of errors on all tests was 39.82 with a standard deviation of 24.66. The Group I aphasics made the following mean percentage of error over the five sections of The Minnesota Test:

\[ \text{\textsuperscript{22}} \]
As can be seen in Figure 1, the senile subjects experienced greater difficulty than did the Group I aphasics over all five sections of the test. The means, standard deviations, mean percentage of error, and the percentage of subjects erring for the individual subtests are presented in Table 2.

Analysis of data. On the basis of 36 out of 45 t-tests being significant at the 10 percent level, the null hypothesis that there is no significant difference between the language abilities of Group I aphasics as defined by Schuell and the language abilities of senile patients as measured by The Minnesota Test for Differential Diagnosis of Aphasia was rejected. The means of each group and the t-test results are presented in Table 2.
TABLE 1.—Means, standard deviations, mean percentage of error, and percentage of subjects making errors for 25 senile subjects over five sections of The Minnesota Test for Differential Diagnosis of Aphasia.

<table>
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<th>Type of Test</th>
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<td>Auditory Tests (117)</td>
<td>15.08</td>
<td>10.31</td>
<td>12.9%</td>
<td>92%</td>
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<td>Visual and Reading Tests (160)</td>
<td>20.51</td>
<td>13.43</td>
<td>12.8%</td>
<td>100%</td>
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<td>Speech and Language Tests (182)</td>
<td>22.56</td>
<td>12.50</td>
<td>12.4%</td>
<td>96%</td>
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<td>Visuomotor and Writing Tests (114)</td>
<td>21.92</td>
<td>15.31</td>
<td>19.2%</td>
<td>92%</td>
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<td>Numerical Relations and Arithmetic Processes (33)</td>
<td>11.12</td>
<td>7.66</td>
<td>33.7%</td>
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TABLE 2.—Means, Standard Deviations, Mean Percentage of Error, Percentage of Subjects Making Errors, and t-scores for 25 Senile Subjects and 12 Group I Aphasic Patients over 47 Subtests of The Minnesota Test for Differential Diagnosis of Aphasia

<table>
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<th>TYPE OF TEST</th>
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<th>&quot;A&quot; M</th>
<th>&quot;S&quot; SD</th>
<th>&quot;A&quot; SD</th>
<th>M %age ERROR</th>
<th>&quot;A&quot; %age ERROR</th>
<th>%age Ss ERRING</th>
<th>%age Ss ERRING</th>
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<td>&quot;A&quot; M %age ERROR</td>
<td>%age S s ERRING</td>
<td>%age S s ERRING</td>
<td>t-score</td>
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<td>&quot;S&quot; SD</td>
<td>&quot;A&quot; SD</td>
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<td>M %age ERROR</td>
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<td>%age Ss ERRING</td>
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<td>22.2</td>
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**ARITHMETIC & NUMERICAL TESTS**

- Making change (8) 2.48 .08 2.77 .44 31.0 1.0 68 8 13.41*
- Setting clock (5) 1.32 0.00 1.72 0 26.4 0.0 52 0 12.22*
- Combinations (12) 2.56 .17 2.40 .17 21.3 1.4 76 8 10.86*
- Written problems (8) 4.76 1.58 2.80 1.73 59.5 19.7 92 58 13.36*

*Significant at the 10 percent level

"S" Senile Subjects
"A" Aphasic Patients
Fig. 1.— Mean percentage of error for 25 senile subjects and 12 Group I aphasic patients over five sections of The Minnesota Test for Differential Diagnosis of Aphasia.

Senile Subjects

Group I Aphasics
CHAPTER IV

DISCUSSION

Auditory disturbances. Although the mean number of errors for each subject was 15.08 on all subtests in this section, there are certain subtests which contributed more heavily than others to this score. The tests in this section are graded in difficulty with "Recognizing Common Words" being the easiest and "Repeating Sentences" being the most difficult (see Appendix B for a description of the subtests). Generally, as the task became more difficult, more subjects made errors, and the number of errors increased. The tests posing the most difficulty for the subjects were those measuring auditory retention span and those measuring the patient's understanding of what he hears.

Like repeating digits, repeating sentences is a test of auditory retention span. As the length of functional language units increased, the subjects tended to make increasingly more errors. For example, three subjects made errors in repeating five digits, and 20 subjects made errors in repeating seven digits. Four of the subjects made errors in repeating "We live across the street from the school" and 17 subjects made errors in repeating "In the summer they sell milk and eggs and a few vegetables."
Although Schuell reports that "the tests for sentence and paragraph comprehension are not diagnostic,"
they were "included to give the examiner a general idea of how much the patient understands of what he hears" (Schuell, 1965, p.27). Ninety-two percent of the subjects made errors in understanding sentences, and 88 percent of the subjects made errors in understanding the paragraph. It appeared that most of the senile errors resulted from reduction of verbal span in that they tended to respond to key words in a sentence as opposed to retaining the entire sequence of words. For example, with a sentence like "Was Abraham Lincoln the first president of the United States?" the patient who apparently could not retain the entire sequence of words appeared to respond to Lincoln and president. This is a meaningful association to which the patient responded affirmatively, although with further questioning, the patient generally knew that George Washington was the first president of the United States. There was also a tendency for the subjects to circumvent rather than to answer yes or no to a question.

Visual and reading disturbances. Two of the subjects were unable to perform three subtests in this section as a result of vision problems hindering the reading of small print. One subject, who was uncooperative at
times, refused on two separate occasions to perform four of the subtests. For purposes of scoring, these subjects were given the mean scores obtained for the remainder of the group on the subtests in question matching words to pictures; reading comprehension, sentences; reading comprehension, paragraphs; and reading rate, sentences). For a description of all subtests, see Appendix B.

Visual and spatial orientation, as measured by tests 1 and 2, appeared to be relatively intact with fewer than one-third of the subjects making errors. However, these tests were designed to screen out gross impairments only.

Reduction of reading vocabulary was measured by two tasks calling for the subject to match printed words to pictures and to match printed to spoken words. The words in both tests are paired so that choices occur between words associated in meaning, words with similar visual patterns, words with similar auditory patterns, and random pairs. Schuell (1965B, p.43) reported that confusions between words associated in meaning, or semantic confusions, are the "best" errors, in that they tend to be made by subjects who make the fewest total errors on vocabulary tests. Sixty percent of the senile sample erred on differentiating between associated pairs when matching words to pictures, as
opposed to 56 percent and fewer erring on auditory confusions, visual confusions, and irrelevant responses. This, however, was not the case when the subjects matched printed to spoken words. In this task, only 4 percent of the sample showed evidence of semantic confusions, as measured by errors in differentiating between associated pairs. More auditory errors appeared on the latter subtest, indicating perhaps that visual cues were less effective than auditory cues in stimulating word recognition between associated pairs of words.

Verbal retention span appeared to be the primary source of problems for the senile patients tested. Eight-eight percent of the subjects made errors on Test 5, "Reading Comprehension, Sentences." Sentences most frequently missed were: (1) Is summer colder than winter? (2) Is the president of the United States appointed by Congress? This was possibly indicative of a tendency to respond to meaningful associations, such as colder-winter and president-Congress, in the absence of the ability to read or retain the entire sentence. Comprehension, as measured over a paragraph was apparently the most difficult task for these subjects in this section of The Minnesota Test. All 25 subjects made a mean percentage of error of 51.8 percent.

Schuell (1965, p.47) reported that verbal retention span appeared to be an important dimension of reading
comprehension, so it might be suggested that impairment of verbal retention span was a highly contributary factor in the majority of subjects erring on these subtests. Another contributing factor was the subjects' ability to follow the printed line and to keep his place while reading. This appeared to be a moderately difficult task for some, and resulted in errors when marking the yes or no answers. Spatial disorientation was an inferred factor in this regard.

The senile group had a mean reading rate of 172 seconds, reading rate being operationally defined as the time in seconds required to complete Test 5 (Schuell, 1965, p.45). On Schuell's 7-point scale ranging from no impairment (0) to extreme severe impairment (6), 172 seconds falls within the category of moderate impairment (3), which includes 151 seconds to 180 seconds.

The oral reading tests were included in the Schuell test primarily to enable the examiner to observe the kind of reading difficulties a given patient encountered. In this case, the most prevalent type of difficulty was scattered errors involving the omission, substitution, and/or addition of words, in addition to a general slowness.

Speech and language disturbances. Once again the subtests in this section were graded in difficulty, and a descrip-
Tlon of each of them appears in Appendix B.

Tests producing the highest percentage of subjects making errors were primarily those designed to diagnose reduction of vocabulary, reduction of length and completeness of verbal units and reduction of verbal retention span. As the tests increased in difficulty, more subjects made errors, and in general, more errors were made. More than 80 percent of the subjects made errors on the following subtests: (1) "Imitating Gross Movements;" (2) "Giving Biographical Information;" (3) "Describing a Picture;" (4) "Defining Words;" and (5) "Retelling a Paragraph." With the exception of the first subtest these were indicative of problems with vocabulary, length and completeness of verbal units, and verbal retention span.

The high percentage of subjects making errors in the task of imitation of gross movements might be attributable to such causes as a general reduction of motor coordination or to a paresis of the musculature in the older age group of individuals as was tested in this study.

When describing a picture the subjects showed a general slurring of speech with occasional breakdowns in communication as denoted by Schuell (1965, pp. 15-16). The breakdowns in communication included such things as difficulty in thinking of a word, use of...
the wrong word and a tendency to enumerate rather than to integrate the multiple stimuli presented by the picture into meaningful statements.

In defining words which were chosen for the test as being familiar to most adults of average intelligence and average educational level, it appeared that although the individual had a general idea of what the word meant, he was unable to use other terms in a definition. He also tended to give examples as opposed to definitions.

Tests 9 and 15, "Giving Biographical Information" and "Retelling a Paragraph" were, for the most part, memory tasks. In tasks of this nature the senile subject tended to make errors, reporting that his "memory isn't as good as it used to be." They also tended to reminisce about their own experiences as opposed to reporting what had been read to them as in the task of retelling a paragraph. On the average they were able to produce three or four specific memories, out of approximately 16 presented, with or without irrelevancies.

Over 50 percent of the subjects showed a reduction of the length and completeness of verbal units as measured by their ability to produce sentences using a given word. The most common error was the failure to present a complete thought or sentence. The senile
subject said such things as "a new coat" or "after dinner" instead of producing sentences using the words new and after. This impairment, according to Schuell (1965g, p.53), correlates with reduction of vocabulary and verbal retention span.

**Visuomotor and writing disturbances.** Schuell (1965g, p.73) reported that "writing requires language, and, in addition, learned visuomotor integrations. The problem of differential diagnosis of writing impairment was to determine if the performance of a patient reflects reduction of language, impaired visual recall, spatial imperception, or some combination of these dimensions" (Schuell, 1965g, p.74).

The first five subtests in this section involve the ability of the patient to reproduce or recall visual forms. Although there was no pattern of progressively more errors being made as the tasks became more difficult, there were several subtests which stood out as being more difficult in terms of the percentage of subjects making errors. One of these was reproducing a wheel after the pictured stimuli had been withdrawn (see Appendix B). This appeared to be primarily a test of spatial disorientation "since a wheel is a common object and the figure was scored correct if the subject produces a recognizable circle, with spokes that approximate the rim in all quadrants and intersect in
the general area of the center of the circle." Spatial disorientation was suggested for those subjects who drew "parallel spokes running horizontally or vertically, or sometimes spokes attached to a segment of a radius in a constricted sector."

Sixty-eight percent of the subjects erred in the reproduction of letters, however confusions between writing the letters as opposed to copying them seemed more prevalent than those involving reversals or distortions of letter forms. This could be attributed to carelessness in following instructions, or reduction of visual recall, in addition to possible spatial disorientation.

Although 84 percent of the subjects made errors when writing letters to dictation, these errors were scattered and consisted primarily of confusion between letters whose names sound alike. This task was reported by Schuell to be a measure of visual recall, although the senile subjects' results suggested that it may have been more of an auditory discrimination test.

The last five subtests in this section dealt more specifically with written language than did the first five. With the exception of oral spelling, from 72 percent to 92 percent of the subjects experienced difficulty on these tests.
The 25 subjects obtained a mean score of 2.68 out of a possible 6 in producing written sentences using a given word. The relative inability to produce sentences of this nature is an indication of language reduction, as is difficulty in writing sentences to dictation and writing a paragraph about a picture. In addition, Schuell (1965B, p.85) reported that "to produce sentences one must have adequate vocabulary and adequate verbal retention span to process verbal messages, as well as an acquired system of visual symbols." Ninety-two percent of the subjects made errors in writing sentences to dictation, and the number of errors increased as the sentences increased in length, indicating that auditory retention span may have been a factor here. When writing a paragraph, the subjects were generally able to perform the task, making both meaningful and relevant statements. However, there was generally one or both of the following defects: 9 to 12 errors in spelling and essential punctuation; sentences impaired by omission or misuse of words. Disturbances of numerical relations and arithmetic processes. In order to avoid necessary overlap with educational level, the tests in this section were confined by Schuell to functional skills related to the value of coins, setting a clock, and simple computations in addition, subtraction, multiplication, and
division. The problems were similar to those included in third-, fourth-, and fifth-grade tests in most graded series (Schuell, 1965b, p. 89).

Over half of the subjects made errors in this section with 90 percent of the subjects making errors on the most difficult task of the four which was performing simple arithmetic computations. The errors were scattered and apparently were a result of the inability to recall learned combinations. The mean number of errors over this subtest was 4.76 out of a possible 8 items.

It was suggested that many of the errors were due to misuse of specific abilities such as handling money and doing arithmetic computations by older patients such as those sampled for the present study.

SUMMARY OF DESCRIPTION

To summarize the findings, the following were presented as being quantifiable descriptive of the language characteristics of senile subjects as measured by The Minnesota Test for Differential Diagnosis of Aphasia:

1. Reduced auditory retention span.
2. Reduced understanding of what is heard.
3. Reduced vocabulary as a result of semantic confusions and auditory confusions.
4. Reduced verbal retention span.
5. Impaired spatial orientation.
6. Reduction of the length and completeness of verbal units.
7. Reduced ability to recall learned combinations.
In general, the more demanding a communication situation might be, in terms of memory, structure of language, or complexity, the less adequately will the situation be handled by the senile patient. However, in a situation which demands little more of the patient than "small talk" with a small number of people, the patient would probably be able to adequately participate. Such would probably be the case with the nursing home environment, as opposed to a home situation which would place more responsibilities on the patient.

DISCUSSION OF GROUP COMPARISON

There are, for the most part differences significant at the 10 percent level between the language abilities of the two groups in question as measured by The Minnesota Test. For those nine tests which did not differentiate between the two groups, two possible explanations are here presented.

One possible explanation was that there were so few errors obtained on those specific subtests that the two groups were possibly no more deviant than one would expect the average normal adult to be. For example, neither group had higher than 19.3 percent error on the first four subtests in the auditory section, and there was less than 10 percent error on the first three subtests in this section. It might be hypothesized
that these tests would not differentiate normals from Group I aphasics or senile patients in addition to not differentiating between the Group I aphasics and the senile patients.

The other explanation may be that there may have been a common factor such as a "reduction of vocabulary, evidenced by word-finding errors, disrupted communication, or circumlocutions" (Schuell, 1965b, p. 53) between the two groups. And as a result, there would be no difference on subtests measuring this factor. An example of this possibility was the analysis of two subtests—"Naming Pictures" and "Defining Words"—which was not significant at the 10 percent level.

As can be seen in Figure 1, the senile subjects made more errors than did the Group I aphasics. And generally more senile subjects erred on specific subtests than did the aphasics. A possible explanation was that the senile subjects generally made more errors on all subtests than did the aphasics, who tended to make errors only on the more difficult subtests in given sections. This may be an indication of the more general damage experienced in senility as opposed to specific lesions suffered by the Group I aphasics. As a result of specific damage, the aphasic patient will only experience difficulty in specific abilities.

The progression of errors evidenced in both groups would
tend to support this possible explanation. The aphasic patients more generally tended to make progressively more errors as the subtests increased in difficulty, however the senile subjects' errors were more scattered.

The findings with regard to the comparison of the language abilities of the 2 groups were contrary to those of Mitton (1967) who found that his aphasic group experienced greater difficulty than did his senile group. However, in a general comparison with Schuell's Groups II, III, IV, and V, the senile subjects in the present study performed much like those in Mitton's study (1967). That is, apparently the aphasics used by Mitton were more severely impaired than the Group I aphasics in the present study, and thus more comparable to Schuell's patients in her other diagnostic categories (Schuell, et al., 1964). That being the case, the senile subjects in the present study experienced fewer difficulties than did the more severely impaired aphasic groups.

LIMITATIONS OF THE STUDY

A major limitation of this study was the absence of normative data with regard to the language characteristics of the so-called normal adult. It may well be that there is no so-called normal adult. It may well be that there is no so-called normal person in terms
of language abilities in the older age group as was studied here.

IMPLICATIONS OF THE STUDY

The writer suggests several areas for further research in the area of language abilities of senile patients. The first suggestion would be that normative data be collected with regard to the language abilities of adults. That is, the language abilities of the adult in various age groups should be described.

Another suggestion would be to further explore the language abilities of the senile patient by means of a test which measures more specifically sensory modalities as opposed to the general modalities of listening, speaking, reading, and writing as defined by the Schuell test.

Another avenue of exploration might be a study of the observations upon which a medical doctor makes his diagnosis of senility. Apparently the diagnosis is made upon subjective observations of such things as memory problems and disorientation which may at least in part be detectable through hearing the patient speak. In this same light, perhaps a semantical analysis of the language used by the senile patient would lend more to the understanding of the effects of senility.

It is not known whether treatment for the senile
patient would be feasible. One reason for this is that there is a possibility that people in the age range tested would not care enough to be treated. If, however, treatment was to be implemented, it would be suggested that the patient receive systematic therapy such as that presented by Schuell (1964, pp. 368-369) for the problem areas such as reduced retention span and reduced vocabulary which seemed to be typical of the senile sample measured in this study. Another form of therapy which might be more beneficial to the senile patient may be a group therapy in which the therapist stimulates mental activity through discussions or various group projects which might be of interest to the patients. Through work such as this, it would seem possible to retard the gradual deteriorational effects of senility. Ferguson (1959, p. 232) reported that perhaps through knowledge gained from research "...many of the manifestations of senility can be controlled, ameliorated and reversed." In addition to supposed language problems there are psychiatric problems of aging which may also be aided through group therapy such as that suggested here. This therapy would perhaps help the patient to accept themselves and the modifications imposed upon them by their changing circumstances. Perhaps through research it would be possible to develop a test sensitive enough to detect devia-
tions from a normal population in the early stages of senility, allowing for earlier diagnosis. With early diagnosis, possibly therapy could be initiated which would control the manifestations of senility.
CHAPTER V

SUMMARY

Although there has been research with regard to the language abilities of senile patients, the research was primarily concerned with vocabulary functioning and grammatical analysis. The review of literature in the area of language abilities of senile patients revealed implications of language disorders, however no quantifiable descriptions were presented. It was the primary purpose of this study to describe the language characteristics of senile patients as measured by The Minnesota Test for Differential Diagnosis of Aphasia. The secondary purpose of this study was to compare the results of the senile subjects with Hildred Schuell's results for Group I aphasics. Schuell (1964, p.190) defined simple aphasia as "reduction of available language in all modalities, in the absence of specific perceptual, sensorimotor, or dysarthric components," and it appeared that senile patients may have similar types of language problems as those defined by Schuell for the Group I or simple Aphasics.

The Minnesota Test was administered to 25 senile patients who had been chosen for the study on the basis of the following criteria: (1) no history of traumatic
brain damage, including cerebral vascular accidents, brain tumors, and cerebral hemorrhages; (2) diagnosed as being "senile" by the attending physician and referred to as being "senile" by the registered nurse in charge of the respective Medicare accredited nursing home; (3) an average hearing threshold of 40 decibels or better in the speech frequencies; (4) demonstrated ability to read print of the smallest type which must be read in the Schuell examination when it is presented in both visual fields.

The range of errors for the 25 senile subjects on all tests was from 25.5 to 209.5 and the mean number of errors was 91.27 with a standard deviation of 52.15. The mean percentage of error for all tests was 15.1. On the basis of The Minnesota Test, the following were presented as being quantifiably descriptive of the language characteristics of senile patients:

1. Reduced auditory retention span.
2. Reduced understanding of what is heard.
3. Reduced vocabulary as a result of semantic confusions and auditory confusions.
4. Reduced verbal retention span.
5. Impaired spatial orientation.
6. Reduction of the length and completeness of verbal units.
7. Reduced ability to recall learned combinations.

On the basis of the t-tests significant at the 10 percent level, the null hypothesis that there is no significant difference between the language abilities of Group I aphasics as defined by Schuell and the language
abilities of senile patients as measured by The Minnesota Test for Differential Diagnosis of Aphasia was rejected.

The writer suggested several areas for further research in this area, one being that normative data be collected with regard to the language abilities of adults. Another suggestion was the development of tests sensitive enough to detect deviations from a norm in the early stages of senility, allowing for earlier diagnosis and possible therapeutic measures to be implemented.

In conclusion, the writer suggests that there is a great need for research in this particular area as there are many unsolved problems remaining. With the increased number of people living to an older age than ever before, these questions should be answered.
APPENDIX A

THE MINNESOTA TEST FOR DIFFERENTIAL DIAGNOSIS OF APHASIA

Hildred Schuell, Ph.D.

The Minnesota Test was developed as a tool for exploring language disturbances resulting from brain damage in adults. The test is divided into five sections comprising test for auditory disturbances, visual and reading disturbances, speech and language disturbances, visuomotor and writing disturbances, and disturbances of numerical relations and arithmetic processes. The tests in each section are arranged in ascending order of difficulty as determined by the percentage of aphasic subjects who made any error on each test. There are "easy" tests for exploring residual abilities in patients with severe aphasia, and "hard" tests sensitive to mild aphasic impairment. Between these extremes, tests of graduated difficulty make it possible to determine the level at which performance breaks down in each language modality. The test and test items are also constructed to allow the examiner to observe the nature of the disruptions that occur.

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An important advantage to this test is that it has an empirically determined classification system, and the diagnostic categories correlate with relevant neurological findings; they are stable in that test-retest results are consistent. The finding are predictive in that each pattern carries a reliable prognosis for recovery from aphasia. The test materials consist of: (1) 2 cards, each having 6 different pictures; (2) a picture of a man raising a ladder; a house, a garage; 3 boys playing on the roof of the garage; a dog, a tree, grass, and a fence; (3) a set of cards with printed words; (4) a set of cards with series of printed letters; (5) a stop watch, a pad of paper, pencils, a flashlight, bell, cup, padlock and key, a long and a short pencil, and a spoon; and (6) the examination form and manual.

Following is a description of tests in Form 8, 1965, of The Minnesota Test:

TESTS FOR AUDITORY COMPREHENSION

1. **Recognition of common words** (18 items). Patients were required to point to 18 pictures of common objects named by the examiner.

2. **Discrimination between paired words** (24 items). Patients were requested to discriminate between two words which sounded alike by pointing to the appropriate picture.

3. **Recognition of letters** (26 items). Cards containing 5 or 6 large printed letters were presented serially. Patients were required to point to the letter named by the examiner.
4. **Identification of items named serially** (6 items). Patients were required to point to objects in a picture named in series of two and series of three.

5. **Understanding sentences** (15 items). Patients were requested to answer Yes or No to simple questions.

6. **Following directions** (10 items). Items were equated for vocabulary difficulty but were progressive in length. Examples: Ring the bell; Put the penny in the cup; Put the bell between the penny and the spoon.

7. **Understanding a paragraph** (6 items). A short narrative paragraph was read to the patient, and he was asked questions about content, which could be answered yes or no.

8. **Repeating digits** (6 items). Patients were requested to repeat series of two, three, four, five, six, and seven digits forward.

9. **Repeating sentences** (6 items). Patients were required to repeat sentences equated for vocabulary difficulty, but progressive in length.

**VISUAL AND READING TESTS**

1. **Matching forms** (5 items). A card was presented containing six large clear geometric forms. Single forms for matching were presented on individual cards.

2. **Matching letters** (20 items). A series of cards was presented, each containing five or six large upper or lower case printed letters. Individual letters were presented for matching, as in Test 1.

3. **Matching words to pictures** (32 items). Cards containing one picture and two printed words were presented to the patient who was required to point to the word telling what the picture was.

4. **Matching printed to spoken words** (32 items). Cards which contained two printed words were presented to the patient who was required to point to the word read by the examiner.

5. **Reading comprehension, sentences** (12 items). Patients were required to check printed questions yes or no.
6. Reading rate, sentences (6 items). A 7-point scale was developed ranging from 90 seconds or less (0) to over 300 seconds (6), and performance on Test 5 was timed and rated.

7. Reading comprehension, paragraph (8 items). Patients were required to read a short narrative paragraph and check questions on content yes or no.

8. Oral reading, words (15 items). Patients were required to read a list of words, and each mispronunciation was scored as an error.

9. Oral reading, sentences (30 items). Patients were required to read six sentences aloud, and a sentence contained errors for words omitted, words misread, words mispronounced, and added words.

SPEECH AND LANGUAGE TESTS

1. Imitating gross movements (10 items). The patient was required to imitate the examiner in making gross movements of the speech musculature. Example, protrude the tongue, phonate, etc.

2. Rapid alternating movements (8 items). Patients were asked to pronounce a given syllable, then repeat it as rapidly as possible, after demonstration. Error scored if patient could not repeat syllable 15 times in five seconds.

3. Repeating monosyllables (32 items). Patients were required to repeat phonetically edited list of common monosyllabic words.

4. Repeating phrases (20 items). Patients were required to repeat phonetically edited phrases such as man and woman or my favorite vegetable.

5. Counting to 20 (20 items). Patients were asked to count aloud to 20. Numbers were supplied when necessary but scored as errors.

6. Naming days of week (7 items). Procedure as in Test 5.

7. Completing sentences (8 items). Sentences were read to patients, who were required to supply last word. Example: I want a cup of
8. **Answering simple questions** (8 items). Patients were asked questions requiring single word responses. Example: What do you do with a hammer?

9. **Giving biographical information** (15 items). Patients were asked for specific biographical information such as name, birthday, age, etc.

10. **Expressing ideas** (6 items). Patients were asked to tell three things they had done during the day, and three things a good citizen should do.

11. **Producing sentences** (96 items). Patients were asked to produce sentences using a given word provided by the examiner.

12. **Describing pictures** (6 items). Patients were asked to produce sentences using a given word provided by the examiner.

13. **Naming pictures** (20 items). Patients were asked to name pictures presented serially.

14. **Defining words** (10 items). Patients were asked to define simple words such as robin, apple, return, and opinion.

15. **Retelling a paragraph** (6 items). The patients were asked to retell a paragraph which had just been read to them by the examiner.

**VISUOMOTOR AND WRITING TESTS**

1. **Copying Greek letters** (5 items). The patients were asked to copy Greek pi, psi, theta, lambda, and phi.

2. **Writing numbers to 20** (20 items). Patients were asked to write the numbers from 1 through 20.

3. **Reproducing wheel** (6 items). Wheel was presented for 10 seconds, then withdrawn. Patients were asked to draw it as well as possible.

4. **Reproducing letters** (18 items). Upper and lower case printed letters were exposed individually for 2 seconds, then withdrawn. Patients were asked to copy letters as they were on the cards.
5. Writing letters to dictation (26 items). Patients were required to write letters of the alphabet dictated in random order.

6. Written spelling (10 items). Ten words, graded in difficulty, written to dictation.


8. Producing written sentences (6 items). Patients were required to write sentences using a given word such as door, old, and before.

9. Writing sentences to dictation (7 items). Sentences equated for vocabulary difficulty, but progressive in length, were written to dictation.

10. Writing a paragraph (6 items). Patients were asked to write a paragraph describing a picture, and telling what was happening in it. Scale was developed by evaluating responses of aphasic patients.

TESTS OF NUMERICAL RELATIONS AND ARITHMETIC PROCESSES

1. Making change (8 items). Coins were presented, and patients asked to indicate correct change for nickel, dime, quarter, and simple transactions.

2. Setting clock (5 items). Patients were asked to set hands of clock to show when they got up, went to bed, ate supper, and to specified times.

3. Simple numerical combinations (12 items). Patients were required to select correct response to common numerical combinations, in addition, subtraction, multiplication, and division. Combined visual and auditory presentation, with verbal, written, or gesture response permitted.

4. Written problems (8 items). Addition, subtraction, multiplication, and division problems as those found in third-, fourth-, and fifth-grade texts in most graded series.
Linda Clark has my permission to administer a test of aphasia to ________________, who has been diagnosed in part as being senile.

Signed,

________________________________________

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